

## WHAT WE CLAIM IS:

1. Dielectric substrates of the general formula  $\text{Sr}_2\text{RESbO}_6$  where RE is a rare earth metal selected from the group consisting of Lutetium, Ytterbium, Thulium, Erbium, Holmium, Dysprosium, Yttrium, Lanthanum, Gadolinium, Samarium, Praseodymium, Europium,  
5 Neodymium and Terbium.

2. The dielectric substrates, as recited in claim 1, further comprising:  
said dielectric substrates being heated for at least 20 hours at between  $1400^\circ\text{C}$  and  $1600^\circ\text{C}$ ;

10 said dielectric substrates having a low dielectric constant in the range of 4.1 to 16.3;  
said general formula including an  $\text{Sb}^{5+}$  constituent atom with a polarizability of about  $1.2 \text{ \AA}^3$ ; and  
said dielectric substrates having a low dielectric loss in the range of less than  $1 \times 10^{-3}$  to  $9 \times 10^{-3}$  without a phase transition.

15 3. The dielectric substrate, according to claim 2, being constructed of  $\text{Sr}_2\text{LuSbO}_6$ .

4. The dielectric substrate, according to claim 3, wherein:

said dielectric substrate is constructed in a bulk form;

20 said dielectric substrate having a low dielectric constant of 15.1; and

said dielectric substrate having a low dielectric loss of less than  $1 \times 10^{-3}$ .

5. The dielectric substrate, according to claim 3, wherein:

said dielectric substrate is constructed in a thin film structure;

25 said dielectric substrate having a density GM/CC of 6.87;

said dielectric substrate having a low dielectric constant between 14.3 and 15.9; and

said dielectric substrate having a low dielectric loss less than  $1 \times 10^{-3}$ .

30 6. The dielectric substrate, according to claim 2, being constructed of  $\text{Sr}_2\text{YbSbO}_6$ .

7. The dielectric substrate, according to claim 6, wherein:

said dielectric substrate is constructed in a bulk form;  
said dielectric substrate having a low dielectric constant of 5.1; and  
said dielectric substrate having a low dielectric loss of less than  $1.0 \times 10^{-3}$ .

5        8. The dielectric substrate, according to claim 6, wherein:

----- said dielectric substrate is constructed in a thin film structure;  
said dielectric substrate having a density GM/CC of 6.86;  
said dielectric substrate having a low dielectric constant between 4.8 and 5.4; and  
----- said dielectric substrate having a low dielectric loss of less than  $1.0 \times 10^{-3}$ .

10       9. The dielectric substrate, according to claim 2, being constructed of  $\text{Sr}_2\text{TmSbO}_6$ .

10. The dielectric substrate, according to claim 9, wherein:

15       said dielectric substrate is constructed in a bulk form;  
said dielectric substrate having a low dielectric constant of 10.0; and  
said dielectric substrate having a low dielectric loss of  $2.0 \times 10^{-3}$ .

11. The dielectric substrate, according to claim 9, wherein:

20       said dielectric substrate is constructed in a thin film structure;  
said dielectric substrates having a density GM/CC of 6.77;  
said dielectric substrate having a low dielectric constant between 9.5 and 10.5; and  
said dielectric substrate having a low dielectric loss of  $2.0 \times 10^{-3}$ .

12. The dielectric substrate, according to claim 2, being constructed of  $\text{Sr}_2\text{ErSbO}_6$ .

25       13. The dielectric substrate, according to claim 12, wherein:

said dielectric substrate is constructed in a bulk form;  
said dielectric substrate having a low dielectric constant of 5.3; and  
said dielectric substrate having a low dielectric loss of  $1.6 \times 10^{-3}$ .

30       14. The dielectric substrate according to claim 12 wherein:

said dielectric substrate is constructed in a thin film structure;  
said dielectric substrate having a low dielectric constant of 4.1; and  
said dielectric substrate having a low dielectric loss of  $3.2 \times 10^{-3}$ .

5 15. The dielectric substrate, according to claim 2, being constructed of  $\text{Sr}_2\text{HoSbO}_6$ .

16. The dielectric substrate, according to claim 15, wherein:  
said dielectric substrate is constructed in a bulk form;  
said dielectric substrate having a low dielectric constant of 11.6; and  
10 said dielectric substrate having a low dielectric loss of about  $3.1 \times 10^{-3}$ .

17. The dielectric substrate, according to claim 15, wherein:  
said dielectric substrate is constructed in a thin film structure;  
said dielectric substrates having a density GM/CC of 6.64;  
15 said dielectric substrate having a low dielectric constant between 11.1 and 12.2; and  
said dielectric substrate having a low dielectric loss of  $3.1 \times 10^{-3}$ .

18. The dielectric substrate, according to claim 2, being constructed of  $\text{Sr}_2\text{DySbO}_6$ .

20 19. The dielectric substrate, according to claim 18, wherein:  
said dielectric substrate is constructed in a bulk form;  
said dielectric substrate having a low dielectric constant of 11.2; and  
said dielectric substrate having a low dielectric loss of less than  $1.0 \times 10^{-3}$ .

25 20. The dielectric substrate, according to claim 18, wherein:  
said dielectric substrate is constructed in a thin film structure;  
said dielectric substrate having a density GM/CC of 6.56;  
said dielectric substrate having a low dielectric constant between 10.6 and 11.8; and  
said dielectric substrate having a low dielectric loss of less than  $1.0 \times 10^{-3}$ .

30 21. The dielectric substrate, according to claim 2, being constructed of  $\text{Sr}_2\text{TbSbO}_6$ .

22. The dielectric substrate, according to claim 21, wherein:

said dielectric substrate is constructed in a bulk form;

said dielectric substrate having a low dielectric constant of 12.9; and

said dielectric substrate having a low dielectric loss of  $1.4 \times 10^{-3}$ .

23. The dielectric substrate, according to claim 21, wherein:

said dielectric substrate is constructed in a thin film structure;

said dielectric substrate having a low dielectric constant of 4.6; and

said dielectric substrate having a low dielectric loss of  $4.0 \times 10^{-3}$ .

24. The dielectric substrate, according to claim 2, being constructed of  $\text{Sr}_2\text{YSbO}_6$ .

25. The dielectric substrate, according to claim 24, wherein:

said dielectric substrate is constructed in a bulk form;

said dielectric substrate having a low dielectric constant of 7.1; and

said dielectric substrate having a low dielectric loss of  $1.4 \times 10^{-3}$ .

26. The dielectric substrate, according to claim 24, wherein:

said dielectric substrate is constructed in a thin film structure;

said dielectric substrate having a density GM/CC of 5.91;

said dielectric substrate having a low dielectric constant between 6.7 and 7.5; and

said dielectric substrate having a low dielectric loss of about  $1.4 \times 10^{-3}$ .

27. The dielectric substrate, according to claim 2, being constructed of  $\text{Sr}_2\text{LaSbO}_6$ .

28. The dielectric substrate, according to claim 27, wherein:

said dielectric substrate is constructed in a bulk form;

said dielectric substrate having a low dielectric constant of 16.3; and

said dielectric substrate having a low dielectric loss of  $3.8 \times 10^{-3}$ .

29. The dielectric substrate according to claim 27 wherein:

said dielectric substrate is constructed in a thin film structure;

said dielectric substrate having a density GM/CC of 5.19.

said dielectric substrate having a low dielectric constant between 14.5 and 16.1; and

said dielectric substrate having a low dielectric loss of about  $3.8 \times 10^{-3}$ .

30. The dielectric substrate, according to claim 2, being constructed of  $\text{Sr}_2\text{GdSbO}_6$ .

31. The dielectric substrate, according to claim 30, wherein:

said dielectric substrate is constructed in a bulk form;

said dielectric substrate having a low dielectric constant of 12.1; and

said dielectric substrate having a low dielectric loss of less than  $1.0 \times 10^{-3}$ .

32. The dielectric substrate, according to claim 30, wherein:

said dielectric substrate is constructed in a thin film structure;

said dielectric substrate having a low dielectric constant of 6.0; and

said dielectric substrate having a low dielectric loss of  $9.0 \times 10^{-3}$ .

33. The dielectric substrate, according to claim 2, being constructed of  $\text{Sr}_2\text{SmSbO}_6$ .

34. The dielectric substrate, according to claim 33, wherein:

said dielectric substrate is constructed in a bulk form;

said dielectric substrate having a low dielectric constant of 13.6; and

said dielectric substrate having a low dielectric loss of less than  $1.0 \times 10^{-3}$ .

35. The dielectric substrate, according to claim 33, wherein:

said dielectric substrate is constructed in a thin film structure;

said dielectric substrate having a low dielectric constant of 8.8; and

said dielectric substrate having a low dielectric loss of  $9.0 \times 10^{-3}$ .

36. The dielectric substrate, according to claim 2, being constructed of  $\text{Sr}_2\text{PrSbO}_6$ .

37. The dielectric substrate, according to claim 36, wherein:

said dielectric substrate is constructed in a bulk form;

said dielectric substrate having a low dielectric constant of 10.9; and

said dielectric substrate having a low dielectric loss of  $2.2 \times 10^{-3}$ .

38. The dielectric substrate, according to claim 36, wherein:

said dielectric substrate is constructed in a thin film structure;

said dielectric substrates having a density GM/CC of 6.02;

said dielectric substrate having a low dielectric constant between 10.4 and 11.4; and

said dielectric substrate having a low dielectric loss of about  $2.2 \times 10^{-3}$ .

39. The dielectric substrate, according to claim 2, being constructed of  $\text{Sr}_2\text{EuSbO}_6$ .

40. The dielectric substrate, according to claim 39, wherein:

said dielectric substrate is constructed in a bulk form;

said dielectric substrate having a low dielectric constant of 14.6; and

said dielectric substrate having a low dielectric loss of less than  $1.0 \times 10^{-3}$ .

41. The dielectric substrate, according to claim 39, wherein:

said dielectric substrate is constructed in a thin film structure;

said dielectric substrate having a low dielectric constant of 4.6; and

said dielectric substrate having a low dielectric loss of  $2.0 \times 10^{-3}$ .

42. The dielectric substrate, according to claim 2, being constructed of  $\text{Sr}_2\text{NdSbO}_6$ .

43. The dielectric substrate, according to claim 42, wherein:

said dielectric substrate is constructed in a bulk form;

said dielectric substrate having a low dielectric constant of 10.6; and

said dielectric substrate having a low dielectric loss of  $2.9 \times 10^{-3}$ .

44. The dielectric substrate, according to claim 42, wherein:

said dielectric substrate is constructed in a thin film structure;

said dielectric substrate having a density GM/CC of 6.13;

said dielectric substrate having a low dielectric constant between 10.1 and 11.1; and

said dielectric substrate having a low dielectric loss of about  $2.9 \times 10^{-3}$ .

45. A thin film high  $T_c$  structure, comprising:

a plurality of thin films constructed of a compound of the general formula  $Sr_2RESbO_6$  wherein RE is a rare earth metal;

said plurality of thin films being interspersed with a plurality of layers constructed of a copper oxide superconductor;

said plurality of thin films being deposited by pulsed laser deposition and being heated for at least 20 hours at between  $750^\circ\text{C}$  to  $825^\circ\text{C}$ ;

said plurality of thin films having a low dielectric constant;

said general formula including an  $Sb^{5+}$  constituent atom with a polarizability of about  $1.2 \text{ \AA}^3$ ; and

said plurality of thin films having a low dielectric loss without a phase transition.

46. A thin film high critical temperature superconductor structure, according to claim 45, further comprising:

said plurality of thin films are constructed of  $Sr_2LuSbO_6$ ;

said plurality of thin films being heated for at least 20 hours at between  $750^\circ\text{C}$  to  $825^\circ\text{C}$ ;

and

said plurality of layers are constructed of  $YBa_2Cu_3O_{7.5}$ .

47. A thin film high critical temperature superconductor structure, according to claim 45, further comprising:

said plurality of thin films are constructed of  $Sr_2LaSbO_6$ ; and

said plurality of layers are constructed of  $YBa_2Cu_3O_{7.5}$ .

48. An antenna, comprising:

a single layer of a copper oxide superconductor deposited onto a single crystal substrate of the formula  $\text{Sr}_2\text{LuSbO}_6$ ;

said single crystal substrate having a low dielectric constant;

said single crystal substrate having a low dielectric loss without a phase transition;

5 said formula including an  $\text{Sb}^{5+}$  constituent atom with a polarizability of about  $1.2 \text{ \AA}^3$ ; and

said single layer of a copper oxide superconductor being patterned to complete the device.

49. A superconductor insulator superconductor step edge Josephson junction,

10 comprising:

a single layer of a copper oxide superconductor deposited onto a single crystal substrate of the formula  $\text{Sr}_2\text{YbSbO}_6$ ;

said single crystal substrate having a low dielectric constant;

said single crystal substrate having a low dielectric loss without a phase transition;

15 said single layer of a copper oxide superconductor being patterned;

a second layer of  $\text{Sr}_2\text{YbSbO}_6$  deposited onto said single layer of a copper oxide superconductor;

said formula including an  $\text{Sb}^{5+}$  constituent atom with a polarizability of about  $1.2 \text{ \AA}^3$ ; and

a second layer of a copper oxide superconductor deposited and patterned on said second

20 layer of  $\text{Sr}_2\text{YbSbO}_6$ .

50. Buffer layers of the general formula  $\text{Sr}_2\text{RESbO}_6$  where RE is a rare earth metal selected from the group consisting of Lutetium, Ytterbium, Thulium, Erbium, Holmium, Dysprosium, Yttrium, Lanthanum, Gadolinium, Samarium, Praseodymium, Europium, 25 Neodymium and Terbium.

51. The buffer layers, according to claim 50, further comprising:

said buffer layers are constructed in a thin film structure;

said buffer layers having a low dielectric constant in the range of 4.8 to 16.1;

30 said general formula including an  $\text{Sb}^{5+}$  constituent atom with a polarizability of about  $1.2 \text{ \AA}^3$ ; and



said buffer layers having a low dielectric loss in the range of less than to  $1 \times 10^{-3}$  to  $9 \times 10^{-3}$  without a phase transition.

52. The buffer layer, according to claim 51, being constructed of  $\text{Sr}_2\text{YbSbO}_6$ .

53. The buffer layer according to claim 52, wherein:

said buffer layer is constructed in a thin film structure;

said buffer layer having a density GM/CC of 6.86;

said buffer layer having a low dielectric constant between 4.8 and 5.4; and

said buffer layer having a low dielectric loss of less than  $1 \times 10^{-3}$ .

54. The buffer layer, according to claim 51, being constructed of  $\text{Sr}_2\text{TmSbO}_6$ .

55. The buffer layer, according to claim 54, wherein:

said buffer layer is constructed in a thin film structure;

said buffer layer having a density GM/CC of 6.77;

said buffer layer having a low dielectric constant between 9.5 and 10.5; and

said buffer layer having a low dielectric loss of about  $2.0 \times 10^{-3}$ .

56. The buffer layer, according to claim 51, being constructed of  $\text{Sr}_2\text{ErSbO}_6$ .

57. The buffer layer, according to claim 56, wherein:

said buffer layer is constructed in a thin film structure;

said buffer layer having a low dielectric constant of 4.1; and

said buffer layer having a low dielectric loss of  $3.2 \times 10^{-3}$ .

58. The buffer layer, according to claim 51, being constructed of  $\text{Sr}_2\text{HoSbO}_6$ .

59. The buffer layer, according to claim 58, wherein:

said buffer layer is constructed in a thin film structure;

said buffer layer having a density GM/CC of 6.64;

said buffer layer having a low dielectric constant between 11.1 and 12.2; and  
said buffer layer having a low dielectric loss of  $3.1 \times 10^{-3}$ .

60. The buffer layer, according to claim 51, being constructed of  $\text{Sr}_2\text{DySbO}_6$ .

61. The buffer layer, according to claim 60, wherein:

said buffer layer is constructed in a thin film structure;

said buffer layer having a density GM/CC of 6.56;

said buffer layer having a low dielectric constant between 10.6 and 11.8; and

said buffer layer having a low dielectric loss of less than  $1.0 \times 10^{-3}$ .

62. The buffer layer, according to claim 51, being constructed of  $\text{Sr}_2\text{TbSbO}_6$ .

63. The buffer layer, according to claim 62, wherein:

said buffer layer is constructed in a thin film structure;

said buffer layer having a low dielectric constant of 4.6; and

said buffer layer having a low dielectric loss of  $1.4 \times 10^{-3}$ .

64. The buffer layer, according to claim 51, being constructed of  $\text{Sr}_2\text{YSbO}_6$ .

65. The buffer layer according to claim 64, wherein:

said buffer layer is constructed in a thin film structure;

said buffer layer having a density GM/CC of 6.56;

said buffer layer having a low dielectric constant between 6.7 and 7.5; and

said buffer layer having a low dielectric loss of about  $1.4 \times 10^{-3}$ .

66. The buffer layer, according to claim 51, being constructed of  $\text{Sr}_2\text{LaSbO}_6$ .

67. The buffer layer, according to claim 66, wherein:

said buffer layer is constructed in a thin film structure;

said buffer layer having a density GM/CC of 5.19;

said buffer layer having a low dielectric constant between 14.5 and 16.1; and  
said buffer layer having a low dielectric loss of about  $3.8 \times 10^{-3}$ .

68. The buffer layer, according to claim 51, being constructed of  $\text{Sr}_2\text{GdSbO}_6$ .

69. The buffer layer, according to claim 68, wherein:

said buffer layer is constructed in a thin film structure;

said buffer layer having a low dielectric constant of 6.0; and

said buffer layer having a low dielectric loss of  $9.0 \times 10^{-3}$ .

70. The buffer layer, according to claim 51, being constructed of  $\text{Sr}_2\text{SmSbO}_6$ .

71. The buffer layer, according to claim 70, wherein:

said buffer layer is constructed in a thin film structure;

said buffer layer having a low dielectric constant of 8.8; and

said buffer layer having a low dielectric loss of  $9.0 \times 10^{-3}$ .

72. The buffer layer, according to claim 51, being constructed of  $\text{Sr}_2\text{PrSbO}_6$ .

73. The buffer layer, according to claim 72, wherein:

said buffer layer is constructed in a thin film structure;

said buffer layers having a density GM/CC of 6.02;

said buffer layer having a low dielectric constant between 10.4 and 11.4; and

said buffer layer having a low dielectric loss of about  $2.2 \times 10^{-3}$ .

74. The buffer layer, according to claim 51, being constructed of  $\text{Sr}_2\text{EuSbO}_6$ .

75. The buffer layer, according to claim 74, wherein:

said buffer layer is constructed in a thin film structure;

said buffer layer having a low dielectric constant of 4.6; and

said buffer layer having a low dielectric loss of  $2.0 \times 10^{-3}$ .

76. The buffer layer, according to claim 51, being constructed of  $\text{Sr}_2\text{NdSbO}_6$ .

77. The buffer layer, according to claim 76, wherein:

5 said buffer layer is constructed in a thin film structure;

said buffer layer having a density GM/CC of 6.13;

said buffer layer having a low dielectric constant between 10.1 and 11.1; and

said buffer layer having a low dielectric loss of about  $2.9 \times 10^{-3}$ .

10 78. The buffer layer, according to claim 51, being constructed of  $\text{Sr}_2\text{LuSbO}_6$ .

79. The buffer layer, according to claim 78, wherein:

said buffer layer is constructed in a thin film structure;

said buffer layer having a density GM/CC of 6.87;

15 said buffer layer having a low dielectric constant between 14.3 and 15.9; and

said buffer layer having a low dielectric loss constant of less than  $1 \times 10^{-3}$ .